

~~SECRET~~

123

PROVISIONAL INTELLIGENCE REPORT

THE CHEMICAL EQUIPMENT INDUSTRY OF EAST GERMANY



CIA/RR PR-146

3 August 1956

CENTRAL INTELLIGENCE AGENCY

OFFICE OF RESEARCH AND REPORTS

DOCUMENT NO. 1
NO CHANGE IN CLASS. FI
1.1 DEC. 1979
CLASS. CHG. BY 1001 TS/S (C)
REVIEWED BY 1001 TS/S (C)
DATE 1 Oct 79
FOLLOWER 01093A001100100001-5

~~SECRET~~

WARNING

This material contains information affecting the National Defense of the United States within the meaning of the espionage laws, Title 18, USC, Secs. 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.

S-E-C-R-E-T

PROVISIONAL INTELLIGENCE REPORT

THE CHEMICAL EQUIPMENT INDUSTRY OF EAST GERMANY

CIA/RR PR-146

(ORR Project 34.499)

NOTICE

The data and conclusions contained in this report do not necessarily represent the final position of ORR and should be regarded as provisional only and subject to revision. Comments and data which may be available to the user are solicited.

CENTRAL INTELLIGENCE AGENCY

Office of Research and Reports

S-E-C-R-E-T

S-E-C-R-E-T

FOREWORD

The chemical equipment industry of East Germany produces heterogeneous industrial equipment in addition to specialized chemical equipment. The term chemical equipment as used in this report is broader than the term as used in the US and is based on the code list of the East German National Economic Plan for 1954 for chemical equipment, which includes pumps and compressors.

The broad definition of the chemical industry may complicate the use of the findings of this report. The analysis of planned and estimated actual production and the discussion of the shortage of chemical equipment, however, should contribute to the understanding of the capabilities of the Sino-Soviet Bloc.

- 111 -

S-E-C-R-E-T

S-E-C-R-E-T

CONTENTS

	<u>Page</u>
Summary	1
I. Introduction	2
A. General	2
B. Definition	2
II. Importance of Chemical Equipment	3
A. General	3
B. To the Sino-Soviet Bloc	4
III. Structure of the Industry	5
A. General	5
B. Main Administrations	6
C. Location of Principal Plants	6
D. Miscellaneous Organizations	6
IV. Production Technology	7
V. Inputs	8
A. Raw Materials	8
B. Labor	9
VI. Shortages	9
A. For Maintenance and Expansion of the Chemical Industry	9
B. For Production of Chemical Equipment	10
VII. Production	11
A. Planned	11
B. Estimated Actual	12

- v -

S-E-C-R-E-T

S-E-C-R-E-T

	<u>Page</u>
VIII. Distribution	14
A. Planned	14
B. Estimated Actual	14
IX. Trade	15
A. Imports	15
B. Exports	16
X. Capabilities, Vulnerabilities, and Intentions.. . . .	19
A. Capabilities.	19
B. Vulnerabilities	20
C. Intentions	20

Appendixes

Appendix A. Classification of Types of Chemical Equipment in East Germany	21
Appendix B. Types of Chemical Equipment Produced in East Germany by the Main Administrations (HV's) of the Ministry for Machine Construction . .	23
Appendix C. Problems of Production	25
Appendix D. Statistical Tables	29
Appendix E. Methodology	33
Appendix F. Gaps in Intelligence	37
Appendix G. Source References	39

S-E-C-R-E-T

Page

Tables

1. Principal Plants Producing Chemical Equipment in East Germany, by Main Administration and by Location, 1955	7
2. Estimated Requirements of Steel, Copper, and Aluminum for Production of Chemical Equipment in East Germany, 1949-54	8
3. Planned and Estimated Actual Production of Chemical Equipment in East Germany, 1949-54	29
4. Planned and Estimated Actual Distribution of Chemical Equipment in East Germany, 1951-54	30
5. Planned and Estimated Actual Exports of Chemical Equipment from East Germany, by Destination, 1951-54	31
6. Calculation of the Estimate of Production of Chemical Equipment in East Germany, 1936	34
7. Comparison of Index of Industrial Production and Production of Chemical Equipment in East Germany, 1949-54	35

Illustrations

Following Page

Figure 1. East Germany: Organization of the Principal Main Administrations Producing Chemical Equipment, 1954 (Chart)	6
Figure 2. East Germany: Principal Plants Producing Chemical Equipment, 1955 (Map)	6

S-E-C-R-E-T

Following Page

Figure 3. East Germany: Planned and Estimated Actual Production of Chemical Equipment, 1949-54 (Chart)	12
Figure 4. East Germany: Planned and Estimated Actual Distribution of Chemical Equipment, by Sector, 1951-54 (Chart)	14
Figure 5. East Germany: Planned and Estimated Actual Exports of Chemical Equipment to the Sino- Soviet Bloc, 1951-54 (Chart)	18

S-E-C-R-E-T

CIA/RR PR-146
(ORR Project 34.499)

S-E-C-R-E-T

THE CHEMICAL EQUIPMENT INDUSTRY OF EAST GERMANY*

Summary

Since 1949, actual production of chemical equipment in East Germany has constantly lagged behind planned production. Under the First Five Year Plan (1951-55), production of chemical equipment was to be increased by 125 percent, compared with a planned increase of 65 percent for all industry. Actual increases have been slight, however, and production probably has not regained the level reached in 1936.

In East Germany, chemical equipment generally is produced in plants under five main administrations of the Ministry for Machine Construction. There are 12 principal plants producing chemical equipment in East Germany.

Hindered by shortages of raw materials and by difficulties in design and construction, East Germany has attempted to relieve its equipment supply problem by covert procurement of critical items and designs from Western manufacturers. The failure of the chemical equipment industry of East Germany to meet production goals probably has restricted the expansion of the chemical industry of the Sino-Soviet Bloc because East Germany is a leading supplier of chemical equipment despite shortages of such equipment for its own industrial uses. East Germany is likewise attempting to export chemical equipment to smaller or underdeveloped countries outside the Bloc.

Underproduction of chemical equipment ultimately will have an adverse effect on every sector of industry in East Germany. The chemical industry has been meeting its production goals by the forced operation of existing equipment, but this practice is creating a replacement problem. Other industries rely on the chemical equipment industry for general-purpose industrial equipment, such as pumps, compressors, kilns, and filters, and are affected by any failure to meet production goals for these items.

* The estimates and conclusions contained in this report represent the best judgment of ORR as of 15 June 1956.

S-E-C-R-E-T

S-E-C-R-E-T

Unless there is a reallocation of industrial resources or increased imports of designs and chemical equipment, East Germany and other Sino-Soviet Bloc countries dependent upon East Germany will continue to suffer from shortages of chemical equipment. Production restrictions, especially a shortage of stainless steel, probably will continue.

I. Introduction.

A. General.

During the past few years, increased emphasis has been placed on the development and expansion of the chemical industry of East Germany and of the Sino-Soviet Bloc. This industry generally needs custom-designed and custom-built equipment to meet specific operating conditions in specific chemical plants. Furthermore, the chemical industry is constantly introducing new products which require new types of production equipment. For these reasons, an expanding chemical industry requires close support from the chemical equipment industry. This report deals with the capabilities, vulnerabilities, and intentions of the chemical equipment industry of East Germany.

B. Definition.

The term chemical equipment includes heterogeneous industrial equipment, varying from small pumps to large, high-pressure, reaction vessels weighing over 100 short tons.

The term chemical equipment as used in this report is broader than the term as used in the US and is based on the code list of the East German National Economic Plan for 1954 for chemical equipment, which includes pumps and compressors. The plan position number for chemical equipment is 27 00 000. 1/*

* For serially numbered source references, see Appendix G.

S-E-C-R-E-T

S-E-C-R-E-T

Among the major types of equipment included in the East German chemical equipment subclassification are vulcanizers, centrifuges, vacuum apparatus and filters, reactors, autoclaves, heat exchangers, pulverizers, mixers, and special machines and apparatus. The pump subclassification includes centrifugal, turbine, steam, acid-resistant, and high-pressure pumps. The compressor subclassification includes turbocompressors and refrigerant, air, and gas compressors. Other subclassifications include ventilators, air blowers, and machines and apparatus for production of liquid fuels.*

II. Importance of Chemical Equipment.

A. General.

The importance of chemical equipment results from the demand for chemicals, which are indispensable to an industrial economy for peaceful and for military purposes, including atomic and nuclear energy uses. The products of the US chemical industry, for example, are essential to the operation of all of the 72 industrial groups listed by the US Department of Commerce. 2/

Because of the importance of chemicals to the war effort, the US Government invested more than US \$4 billion in plants and equipment for making chemicals and allied products between 1941 and 1945. During World War II, major products of the chemical industry included explosives, synthetic rubber, aviation fuels, sulfa drugs, atomic bombs, plastics, and rocket propellants. 3/ It has been estimated that 200 chemicals are required to outfit an infantry platoon and that 1,500 chemicals are used in the production of a battleship. 4/

After the Korean War, additional demands were placed on the chemical industry, including demands for wide-range antibiotics, new synthetic fibers and plastics, plasma volume expanders, titanium, atomic weapons, thermonuclear fusion weapons, and jet engine parts and fuels. Of more than 200 expansion goals set by the US Office of Defense Mobilization, nearly one-third have been for essential chemicals. 5/

* For the complete classification of types of chemical equipment in East Germany, see Appendix A.

S-E-C-R-E-T

The chemical industry is dynamic. New products continuously are being developed and commercialized to meet consumer demand. Better construction materials are required for jet aircraft and for atomic and nuclear energy uses. Improved guided missile fuels must be produced, and other chemical products must be developed for military uses. Plastics are developed to relieve shortages of critical materials and to meet increasingly difficult specifications. These ever-changing demands require technological progress in processes and in equipment.

B. To the Sino-Soviet Bloc.

The greatest industrial problem in the expansion of the chemical industry of the Sino-Soviet Bloc is the reported acute shortage of machinery and equipment. 6/ Because East Germany is a leading supplier of chemical equipment to the Bloc, production and export of such equipment by East Germany has a significant effect on production of chemicals in the Bloc. Within the past few years, each of the European Satellites has been making a great effort to expand its chemical industry. In addition to the urgent need for synthetic fuels, rubber, and plastics, heavy industry and agriculture both demand greater supplies of sulfuric acid and artificial fertilizers. Poland, under its Six Year Plan (1950-55), was to have increased its production of chemicals by 350 percent over that in 1948. Czechoslovakia, under its First Five Year Plan (1949-53), was to have increased its production of chemicals by 162 percent over that in 1948. By 1954, Hungary was to have increased its production of chemicals by 138 percent over that in 1949. Rumania, under its First Five Year Plan (1951-55), was to have increased its production of chemicals by 264 percent over that in 1950. East Germany, under its First Five Year Plan (1951-55), was to have increased its production of chemicals by 182 percent over that in 1950. 7/

The European Satellites have not been fulfilling their production goals for chemicals. Poland, for example, is deficient in sulfuric acid, caustic soda, nitrogen fertilizers, and soda ash and is having difficulty in producing superphosphates. Other countries of the Sino-Soviet Bloc also are having problems in meeting goals for certain basic chemicals. To overcome a shortage of chemical equipment, Poland is importing equipment from West Germany. 8/

S-E-C-R-E-T

Although East Germany generally has fulfilled its over-all plan for production of chemicals, plans for production of certain chemicals have not been fulfilled, because of shortages of equipment. The goal for 1955, which was revised downward, probably will be met on an over-all basis. East Germany, however, will be faced with the problem of increasing the production of its chemical equipment industry if it is to maintain and expand its chemical industry.

The chemical industry of the Sino-Soviet Bloc is not alone in being affected by the production of the East German chemical equipment industry. The shortage of such equipment as pumps, compressors, blowers, ventilators, and other general-purpose industrial equipment included under the East German chemical equipment subclassification also has affected and will continue to affect over-all industrial production in East Germany and other European Satellites, which depend upon East Germany for such equipment.

III. Structure of the Industry.

A. General.

The chemical equipment industry of East Germany is not a homogeneous, well-defined industry. It produces specialized chemical equipment and also general-purpose industrial equipment, such as pumps, compressors, filters, kilns, heat exchangers, and the like, for use in various industries. The use of these items of equipment in the chemical industry, however, presents particular problems. A steel pump may work satisfactorily in a power-generating station but fail in a chemical plant if it is not designed properly and constructed of the proper materials for use with specific chemicals.

In East Germany, chemical equipment generally is produced in plants under five main administrations of the Ministry for Machine Construction (Ministerium fuer Maschinenbau). In addition to chemical equipment, these plants produce many other types of industrial equipment. The Karl Liebknecht Machinery Plant at Magdeburg-Buckau, for example, also produces diesel engines, dredgers, cranes, excavators, and rolling mills.

- 5 -

S-E-C-R-E-T

S-E-C-R-E-T

B. Main Administrations.

The organization of the principal main administrations producing chemical equipment in East Germany in 1954 is shown in Figure 1.* 9/ These main administrations are under the control of the Heavy Machine Construction (Schwermaschinenbau) and the Power and Electric Machine Construction (Energie- und Elektromaschinenbau) Production Areas of the Ministry for Machine Construction.

The principal main administrations producing chemical equipment are the Main Administration for Equipment for the Chemical, Ceramic, Food-Processing, and Luxuries Industries (Hauptverwaltung Ausrüstung fuer Chemie, Keramik, und Nahrungs- und Genussmittel Industrie), and the Main Administration for Power Machinery and Motors (Hauptverwaltung fuer Kraft- und Arbeitsmaschinenbau). The types of chemical equipment produced by the five main administrations are listed in Appendix B.

C. Location of Principal Plants.

The location of the 12 principal plants producing chemical equipment in East Germany are shown in Figure 2,** and Table 1*** lists these plants by main administration and by location. These plants produce the bulk of the chemical equipment produced in East Germany. 10/

D. Miscellaneous Organizations.

Among the organizations in East Germany engaged in the design of chemical equipment are the Construction and Engineering Bureaus (Konstruktions- und Ingenieurbuero) at Leuna, Leipzig, and Berlin, while the design of pumps is carried out by the Central Construction Bureau for Pump Installations (Zentrales Konstruktionsbuero fuer Pumpenanlagen) at Halle. The design and construction of chemical plants is handled by the organization Design and Erection of Chemical Plants (Projektierung und Anlagenbau Chemie) at Dresden. 11/

* Following p. 6. For the German titles of the main administrations shown in Figure 1, see Appendix B.

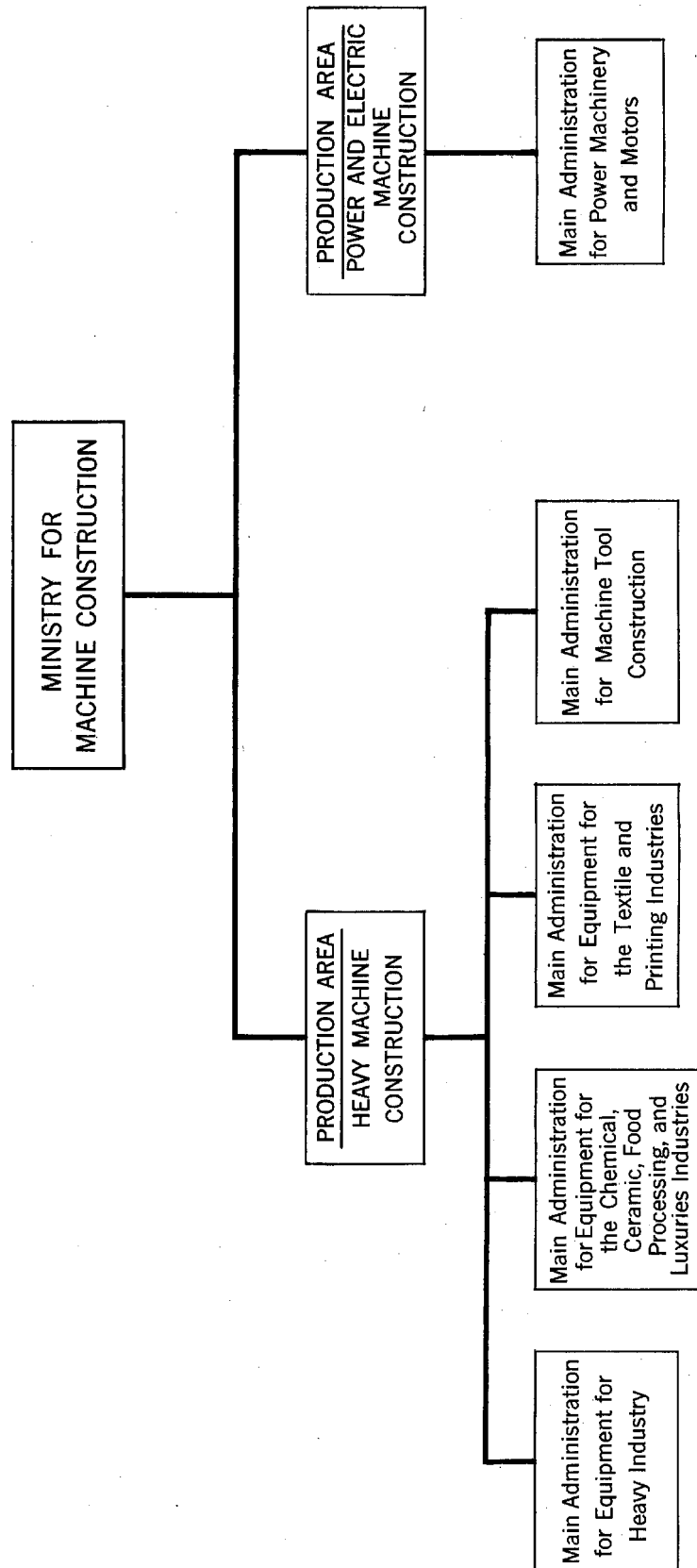
** Following p. 6.

*** Table 1 follows on p. 7.

SECRET

Figure 1

EAST GERMANY
ORGANIZATION OF THE PRINCIPAL MAIN ADMINISTRATIONS
PRODUCING CHEMICAL EQUIPMENT, 1954



25524 7-56

SECRET

SECRET

Approved For Release 2000/04/17 : CIA-RDP79-01093A001100100001-5



Approved For Release 2000/04/17 : CIA-RDP79-01093A001100100001-5

SECRET

S-E-C-R-E-T

Table 1

Principal Plants Producing Chemical Equipment in East Germany
by Main Administration and by Location
1955

Plant	Main Administration	Location
Chemical Equipment Plant	a/	Rudisleben
Nagema Halle Machine Plant	a/	Halle
Nagema Stassfurt Machine and Apparatus Plant	a/	Stassfurt
Nagema Germania Machine Factory	a/	Karl-Marx-Stadt
Wurzen Machine Factory and Iron Foundry	a/	Wurzen
Sangerhausen	a/	Sangerhausen
Karl Liebknecht Machinery Plant	b/	Magdeburg-Buckau
Zwickauer Machinery Plant	b/	Zwickau
Halle Pump Plant	b/	Halle
Pump and Blower Plant	b/	Leipzig
Ernst Thalmann Machinery Plant	c/	Magdeburg-Buckau
7 October Plant	c/	Magdeburg

- a. Main Administration for Equipment for the Chemical, Ceramic, Food-Processing, and Luxuries Industries.
- b. Main Administration for Power Machinery and Motors.
- c. Main Administration for Equipment for Heavy Industry.

IV. Production Technology.

The problems involved in production technology are not peculiar to East Germany alone. These problems are discussed briefly in Appendix C to indicate what East Germany must face in the development and expansion of its chemical industry and in the production of chemical equipment.

- 7 -

S-E-C-R-E-T

S-E-C-R-E-T

V. Inputs.A. Raw Materials.

Construction materials used in the production of chemical equipment vary from aluminum to zirconium. The principal material input, however, is carbon steel. Other important construction materials used are alloy and stainless steels, copper alloys, glass, plastics, rubber, ceramics, carbon, lead, and nickel. Based on US production data for chemical and related equipment, ^{12/} the estimated requirements of steel, copper, and aluminum for production of chemical equipment in East Germany during 1949-54 are shown in Table 2.

Table 2

Estimated Requirements of Steel, Copper, and Aluminum
for Production of Chemical Equipment in East Germany ^{a/}
1949-54

				Short Tons ^{b/}	
Steel				Nonferrous Metals	
<u>Year</u>	<u>Carbon</u>	<u>Alloy</u>	<u>Stainless</u>	<u>Copper</u>	<u>Aluminum</u>
1949	11,200	1,000	400	900	200
1950	12,800	1,200	500	1,100	200
1951	14,300	1,300	600	1,200	200
1952	15,300	1,400	600	1,300	300
1953	16,100	1,500	600	1,300	300
1954	16,800	1,600	700	1,400	300

a. For the derivation of these figures, see Appendix E.

b. Rounded to the nearest 100 tons.

Based on the estimated supply of carbon and alloy steels in East Germany, the amount of these steels required for production of chemical equipment is relatively small. In 1953, less than 1 percent of East German production of carbon and alloy steel was used for production of chemical equipment. Steel plate, however, was in short

S-E-C-R-E-T

supply, as is shown in VI, below. About 3 percent of the total production of copper and approximately 1 percent of the total production of primary aluminum were required for production of chemical equipment.

Stainless steel, which has continuously been in critical supply in East Germany, is still in short supply in production of chemical equipment. Based on the estimated requirements of stainless steel, approximately 40 percent of the total East German production of stainless steel of 1,500 short tons was required for production of chemical equipment in 1953. The shortage of stainless steel undoubtedly has made necessary the use of less desirable construction materials as substitutes, and stainless steel probably will continue to be in short supply for production of chemical equipment unless the capacity to produce stainless steel is increased or other sources of supply or substitutes become available.

B. Labor.

The number of workers engaged in the production of chemical equipment in East Germany is not available.

VI. Shortages.

A. For Maintenance and Expansion of the Chemical Industry.

In the early postwar years the chemical industry of East Germany experienced severe production difficulties because of rundown installations, inadequate repair facilities, and shortages of new equipment. Production of chemical equipment in East Germany was insufficient to meet the quantitative and qualitative demands of the chemical industry. When trade restrictions were lifted in 1949, every measure was taken to procure from West Germany equipment which could not be produced in East Germany. 13/ After trade controls were imposed, East Germany continued to get chemical equipment from the West, avoiding trade control measures and obtaining the equipment through transshipments.

The continued shortage of equipment for maintenance and expansion of the chemical industry of East Germany restricted production of liquid fuels, organic and inorganic chemicals, plastics, and other products of the chemical industry. As late as 1953 and 1954, shortages of equipment were reported. Production of liquid fuels at the Rositz and Schwarzheide cracking plants was curtailed because of

S-E-C-R-E-T

shortages of stainless and alloy steels, steel plate, seamless steel tubing, retorts, pressure vessels, and replacement parts for chemical equipment. 14/ Lack of engineering drawings also prevented further increases in production of liquid fuels. The expansion of production of liquid fuels at the Luetzkendorf Plant was retarded when delivery of engineering drawings from the West was prevented. 15/

The Buna Plant repeatedly experienced similar difficulties in obtaining chemical equipment and replacement parts, particularly crankshafts for compressors. To overcome these difficulties, the plant attempted to produce some of its replacement needs, but with little success. 16/

Other chemical plants in East Germany reportedly have had equipment shortages. Shortages of sheet metal, alloy steels, and high-pressure pipes interfered with production at the hydrogenation unit at the Leuna Plant. 17/ The shortage of equipment for producing ammonia at the Leuna Plant was overcome by importing equipment through Switzerland from West Germany. 18/ In late 1953, after waiting more than a year to get platinum catalysts imported from West Germany through Switzerland, the Bitterfeld Plant reportedly was still short of platinum catalysts used for production of nitric acid. 19/ In 1954, production of plastics was reported to be curtailed by a lack of high-pressure equipment. 20/ Additional production of chemicals was delayed when the equipment for an organic chemical installation at the Bitterfeld Plant was not available. 21/

B. For Production of Chemical Equipment.

Since the end of World War II, production of chemical equipment in East Germany has been curtailed by problems of design, shortages of raw materials and component parts, and difficulties in production, especially of pumps and compressors.

1. Design.

The reconstruction of the sulfuric acid plant at Muldenhuetten was delayed by the lack of several important units of equipment. To overcome the lack of prototypes available for copying, the Construction and Engineering Bureau at Leuna obtained the necessary engineering drawings from West Germany. 22/

S-E-C-R-E-T

Because of shortages of ball bearings, the Central Construction Bureau for Pump Installations had serious difficulties in designing pumps. Because ball bearings are not allocated on the basis of requests submitted by plants but on the basis of availability of ball bearings, pumps frequently have to be redesigned. 23/ Until the proper allocation of ball bearings is made, such design and redesign problems will continue.

2. Raw Materials.

Shortages of raw materials have consistently restricted production of chemical equipment in East Germany. Raw materials in short supply include lead, acid-resistant steel, chromium, nonferrous metals, alloy steel, and steel plate. A project for the construction of a hydrogenation plant for Hungary was stopped because of the lack of materials, especially of steel plate. The shortage of stainless steel probably will remain critical unless additional sources of supply or substitutes become available. 24/

3. Component Parts.

The principal difficulties in production of pumps and compressors are shortages of castings and forgings, a common occurrence in East Germany. Another production problem is the large proportion of rejects of castings and forgings reported by a number of plants, including the Zwickauer Machinery Plant, the Halle Pump Plant, and the Leipzig Pump and Blower Plant. The constant rejects of chromium-steel castings and crankshafts also restrict production. Many of the castings are rejected because of faulty dimensions, blowholes, and other defects. The rough-size dimensions of forgings often do not allow enough tolerance for the necessary machining. 25/ Other restrictions which are reported to be curtailing East German production of pumps and compressors are shortages of bearings, piston rings, and motors. 26/

VII. Production.

A. Planned.

To meet the demand for chemical equipment, production of chemical equipment in East Germany during the First Five Year Plan was to be more than doubled. Planned production was 201 million East German Marks (Deutsche Mark East -- DME) in 1951 and was to

S-E-C-R-E-T

increase to 454 million DME in 1955, with great emphasis on exports. 27/ Figure 3* compares planned production of chemical equipment with estimated actual production in East Germany during 1949-54.** As an indication of the importance placed on chemical equipment by East Germany, production of chemical equipment was planned to expand more rapidly than total industrial production. Compared with that in 1951, production of chemical equipment in 1954 was to be increased at more than twice the rate of total industrial production. During the First Five Year Plan, production of chemical equipment was to increase by 125 percent, with an increase of 65 percent for all industry.

B. Estimated Actual.

In view of the shortages faced in production of chemical equipment in East Germany, it is not surprising that actual production consistently has lagged behind planned production. Despite annual increases in production from 1949 to 1954, during this period the gap between actual and planned production of chemical equipment widened more each year, and the rate of production decreased as is shown by the slope of the production line in Figure 3. In the first 4 years of the plan, production of chemical equipment increased by only about 17 percent, compared with a planned increase of about 97 percent.

The plan for production of chemical equipment apparently was revised downward. Revised planned production of chemical equipment in 1953 was 158 million DME. 28/ Estimated actual production of chemical equipment in 1953 was only 147 million DME, a figure which even fell short of the revised plan.

* Following p. 12. For the source of the figures, see Appendix D, Table 3. 1 DME = US \$0.30.

** Actual production data are based on net production and are compared with planned gross production data. This underevaluation of net production, however, is offset by delivery prices, which generally are higher than planned prices.

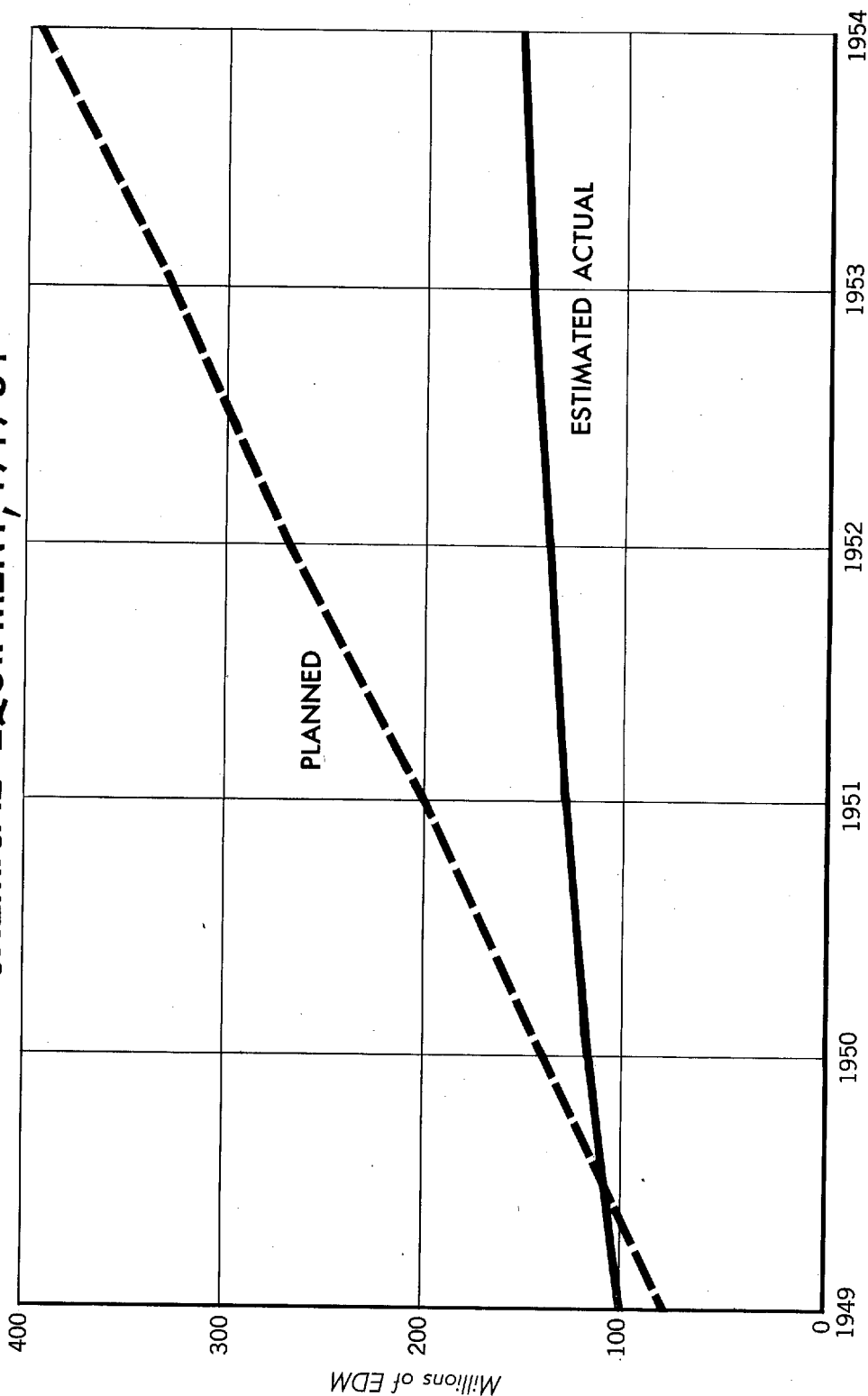
S-E-C-R-E-T

SECRET

Figure 3

EAST GERMANY

PLANNED AND ESTIMATED ACTUAL PRODUCTION OF CHEMICAL EQUIPMENT, 1949-54



25525 7-56

SECRET

S-E-C-R-E-T

Production of chemical equipment in East Germany probably has not yet reached prewar levels. In 1936, estimated production of chemical equipment in the area which is now East Germany was 184 million Reichsmarks (RM).*

Although East Germany is faced with difficulties in production of chemical equipment, production can be increased at the expense of other industries by reallocating resources. In 1954, East Germany produced 153 million DME of chemical equipment, an amount which represented less than 2 percent of the total production of the East German Ministry for Machine Construction. The reallocation of resources will take time and effort, however, particularly in the development and construction of equipment for production of new chemicals.

The shortage of chemical equipment undoubtedly has restricted industrial production in East Germany. Although the chemical industry has been meeting its over-all production goal, probably by use of excess capacity and available equipment beyond normal operating conditions, lack of equipment has caused nonfulfillment of planned production of certain items. The chemical industry of East Germany probably has attained its productive capacity, and increased production of chemicals will require additional capital investment. Furthermore, increased allocation of chemical equipment probably must be made to replace equipment which has been used beyond normal operating conditions. Because general-purpose equipment, such as pumps and compressors, is widely used in other industries, shortages of these items probably have restricted production in other industries.

Nonfulfillment of production goals in East Germany is believed to have caused a reduction in planned exports of chemical equipment. Because East Germany is a leading source of supply for this equipment, the decrease in exports probably has affected the development and expansion of the chemical industries of the Sino-Soviet Bloc, as well as of other industries using general-purpose industrial equipment.

* 1 RM = US \$0.40. A strict comparison of prewar production with planned and estimated actual production in East Germany cannot be made, because the values in the First Five Year Plan are based on 1944 fixed prices used for planning purposes and because of changes in product mix and price levels. For the derivation of the estimate of production in 1936, see Appendix E.

S-E-C-R-E-T

VIII. Distribution.

A. Planned.

East Germany was too optimistic in planned distribution of chemical equipment, as it was in planned production. ^{29/} Under the First Five Year Plan, the major portion of production of chemical equipment was to be exported. Exports were to be more than doubled, increasing from 84 million DME in 1951 to 209 million DME in 1954. These amounts represented 42 percent of total production in 1951 and 52 percent in 1954.

Increased emphasis was placed on industrial investment in East Germany during the First Five Year Plan. During 1951-54, approximately 25 percent of the total production of chemical equipment was scheduled for industrial investment. The amount planned for investment in 1951 was 45 million DME, and in 1954, 102 million DME, an increase of nearly 130 percent.

During the same period, about 16 percent of production of chemical equipment was to be used for replacement, maintenance, and modernization of existing equipment. In 1951, 35 million DME of chemical equipment were to be allocated to these uses, and in 1954, 61 million DME.

Chemical equipment also was to be distributed to agriculture, transportation, consumer goods, and inventory. In 1951, 18 percent of total production, or 37 million DME, was to be allocated for these purposes, and during 1952-54, approximately 8 percent was to be so allocated. The absolute amounts in 1952 and 1953 were 26 million DME and 27 million DME, respectively, and the amount was to increase to 34 million DME in 1954.

B. Estimated Actual.

Based on data for estimated actual production of chemical equipment, it is evident that all goals for planned distribution in East Germany could not have been met, except in 1949 when estimated actual production exceeded estimated planned production. Figure 4* shows planned and estimated actual distribution of chemical equipment in East Germany, by sector, during 1951-54.

* Following p. 14. For the source of the figures, see Appendix D, Table 4.

- 14 -

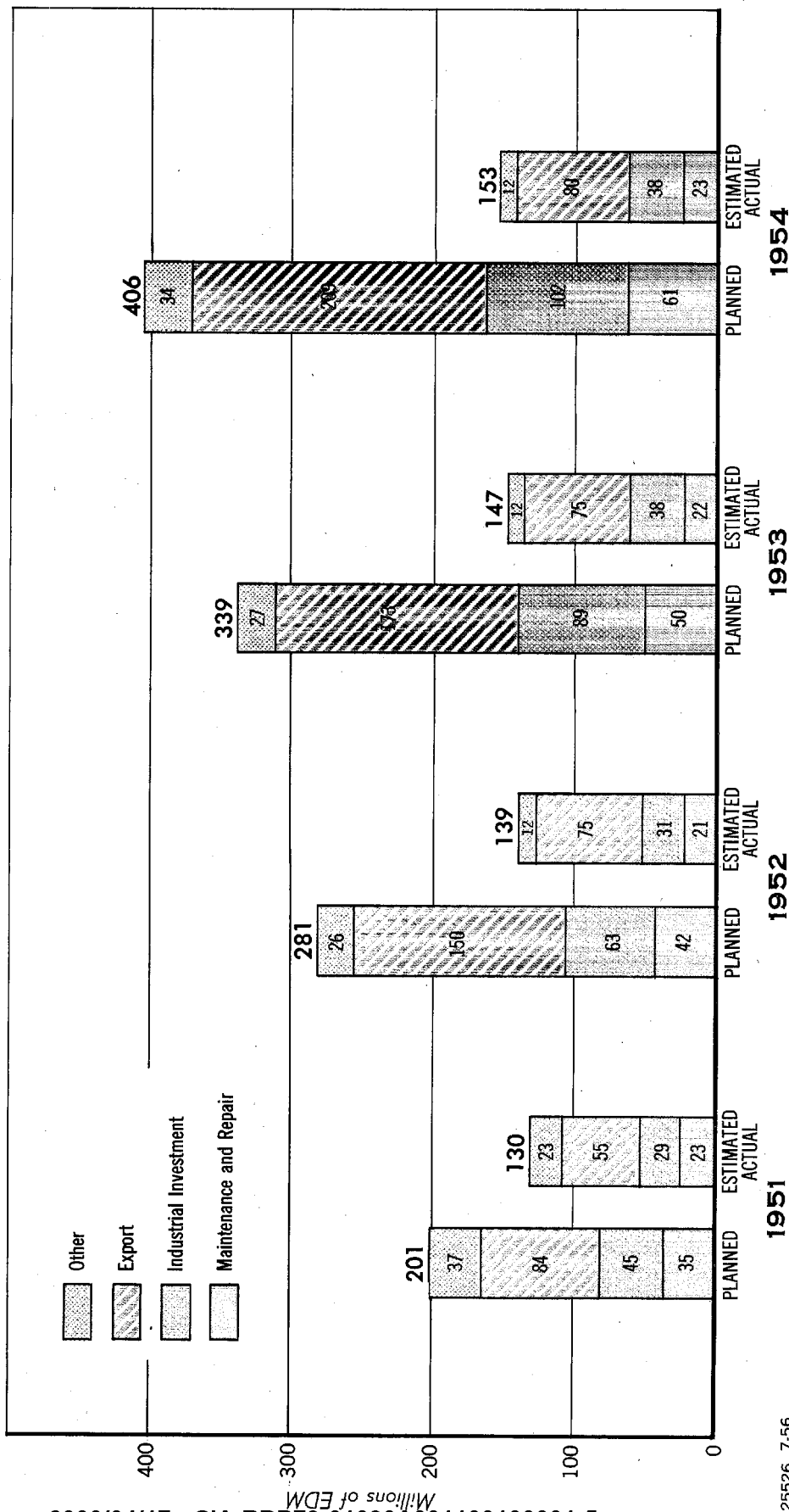
S-E-C-R-E-T

Figure 4

SECRET

EAST GERMANY

**PLANNED AND ESTIMATED ACTUAL DISTRIBUTION
OF CHEMICAL EQUIPMENT BY SECTOR
1951-54**



SECRET

S-E-C-R-E-T

Based on the assumption that production of chemical equipment was allocated in the same proportion as planned, estimated actual exports increased from 55 million DME in 1951 to 80 million DME in 1954, an increase of 45 percent. During the same period the estimated amounts actually allocated to industrial investment increased by 31 percent, from 29 million DME to 38 million DME. The estimated actual distribution for maintenance, replacement, and modernization was 23 million DME both in 1951 and in 1954. Agriculture, transportation, consumer goods, and inventory actually received an estimated 23 million DME of chemical equipment in 1951 and 12 million DME in 1954, a decrease of 48 percent. As shown in Figure 4,* East Germany annually kept falling behind planned goals. The estimated actual allocation of chemical equipment to export was 65 percent of the planned goal in 1951, and this figure declined to 38 percent in 1954. All other sectors showed similar decreases. Nonfulfillment of planned goals probably has affected production of other industries, including those of the Sino-Soviet Bloc which depend upon imports of chemical equipment from East Germany.

IX. Trade.

A. Imports.

To relieve the shortage of critical items of chemical equipment, East Germany has imported various items from the West by transshipments, thus avoiding trade controls. Such imports obtained outside of normal trade channels included oxygen plants shipped from West Germany through Denmark in 1951. 30/ One of these plants reportedly was used as a prototype for the development of oxygen plants in East Germany. 31/

Another strategic item imported from the West was a 19-ton still for the Bitterfeld Plant, designed for production of tricresyl phosphate, which can be used either as a gasoline additive to improve combustion properties or as a plasticizer. This still, manufactured in West Germany, was transshipped through Switzerland and Czechoslovakia. 32/

* Following p. 14.

S-E-C-R-E-T

A plant for production of sulfuric acid from gypsum sulfur was planned to relieve the shortage of sulfuric acid in East Germany. Before production of equipment could be started, however, the engineering drawings for this plant had to be obtained from West Germany. 33/

Other significant imports from the West included equipment for production of formaldehyde, a chemical used in production of plastics, rubber, RDX (cyclonite) explosive, and pharmaceuticals; centrifuges for production of liquid fuels; and equipment for production of nitric acid at the Leuna Plant. The Buna Plant also received heat exchangers from the West in 1954. The nitric acid equipment and heat exchangers were obtained from West Germany through Switzerland. 34/

The imports discussed above are especially significant because the chemicals produced with this imported equipment have direct military uses, depending upon the allocation of the chemicals. The nitric acid may be used in production of fertilizer, munitions, or guided missile fuel. Oxygen may be used for general industrial purposes or may be allocated to military uses such as providing a source of oxygen for jet pilots or serving as a component of guided missile fuel.

B. Exports.

1. Trading Agencies.

In spite of shortages of chemical equipment for its own industrial uses, East Germany is a major source of supply for other Sino-Soviet Bloc countries, including Communist China and North Korea. There are two principal organizations which handle exports of chemical equipment from East Germany. Deutscher Innen- und Aussenhandel (DIA) Chemieausrustungen (German Internal and Foreign Trade of Chemical Equipment), Berlin, is the agency responsible for exporting chemical equipment. 35/ Exports of complete plants for inorganic and organic chemical industries are handled by DIA Invest-Export, Berlin.

2. Planned and Estimated Actual Exports.

During the First Five Year Plan, exports of chemical equipment from East Germany were to be increased from 84 million DME in 1951 to 209 million DME in 1954 -- an increase of about 150 percent -- and to 259 million DME in 1955. Of the amount planned for

- 16 -

S-E-C-R-E-T

S-E-C-R-E-T

export in 1955 -- 57 percent of the total production of chemical equipment 36/ -- a large portion was scheduled to be sent to the USSR. The USSR was to receive 60 percent of the exports in 1951 and 40 percent in 1954.

East Germany has constantly failed to meet its export plan. One report indicates that the 1954 plan probably was fulfilled by less than a half. 37/ The degree of nonfulfillment of the export plan is shown in Figure 5,* which gives planned and estimated actual exports to the USSR and to other countries of the Sino-Soviet Bloc. In 1951, estimated fulfillment of exports to the USSR was 66 percent of the goal, and by 1954 this figure decreased to 39 percent. There also was a similar decrease in fulfillment of planned exports to the rest of the Bloc, although the absolute amount of exports increased during 1951-54.

Estimated actual exports of chemical equipment from East Germany to the USSR and to the other countries of the Sino-Soviet Bloc increased by 45 percent from 1951 to 1954 and amounted to 55 million DME in 1951 and 80 million DME in 1954. During 1951-54 the proportion of East German exports of chemical equipment which went to the USSR decreased from 60 percent to 40 percent, with the estimated absolute amount remaining at about 32 million DME. Conversely, the proportion of exports which went to other countries of the Bloc increased from 40 percent to 60 percent, and the absolute amount more than doubled, from 22 million DME in 1951 to 48 million DME in 1954. Although the estimated actual exports to the rest of the Bloc showed a large increase, the export plan fell behind schedule, and by 1954 the plan was fulfilled by only 38 percent.

Because East Germany is a major source of supply of chemical equipment for the countries of the Sino-Soviet Bloc, the nonfulfillment of the export plan is believed to have curtailed the expansion of the chemical industries of the Bloc. Unless East Germany expands its production of chemical equipment, allowing for a greater supply to be exported, or unless equipment is imported from countries outside the Bloc, the expansion of the chemical industries of the Bloc probably will have to be slower than planned.

* Following p. 18. For the source of these figures, see Appendix D, Table 5.

S-E-C-R-E-T

3. Trade with Countries Outside the Sino-Soviet Bloc.

In spite of the shortage of chemical equipment in the Sino-Soviet Bloc, East Germany is increasing its efforts to expand its trade with countries outside the Bloc. Present trade agreements for the export of chemical equipment include agreements with Iceland and Finland. 38/

Other East German efforts to expand its foreign trade in chemical equipment have been reported. Under a trade agreement made with India in 1954, East Germany offered equipment for chemical and pharmaceutical production. 39/ In 1954, East Germany also offered India a coking plant, together with facilities for producing chemicals. 40/

East Germany probably will continue to increase its efforts to get a share of the foreign markets for chemical equipment. Rau, the Minister for Foreign and Internal Trade for East Germany, in his opening address at the 1955 Leipzig Fair, mentioned the possibility that plants for the manufacture of acid soda and of equipment for the production of synthetic fibers might be exported to foreign markets. 41/

In its attempts to expand its foreign trade, East Germany will meet increasing competition from such countries as West Germany, the UK, and the US. To compete, East Germany will have to improve the quality of its products. As reported by an East German technical representative, the quality of East German pumps, for example, must be improved if East Germany is to obtain any Western customers. A recent loss of a sale of pumps to Egypt was a result of poor workmanship. 42/ Furthermore, as indicated by Rau's statement and by the types of equipment exported and offered to countries outside the Sino-Soviet Bloc, East Germany is believed to be unable to compete with other countries in equipment involving the latest design and techniques.

4. Types of Equipment Exported to the Sino-Soviet Bloc.

a. USSR.

East Germany has exported various types of chemical equipment to the Sino-Soviet Bloc. Exports to the USSR have included machinery for production of fertilizer, penicillin, hydrogen peroxide,

- 18 -

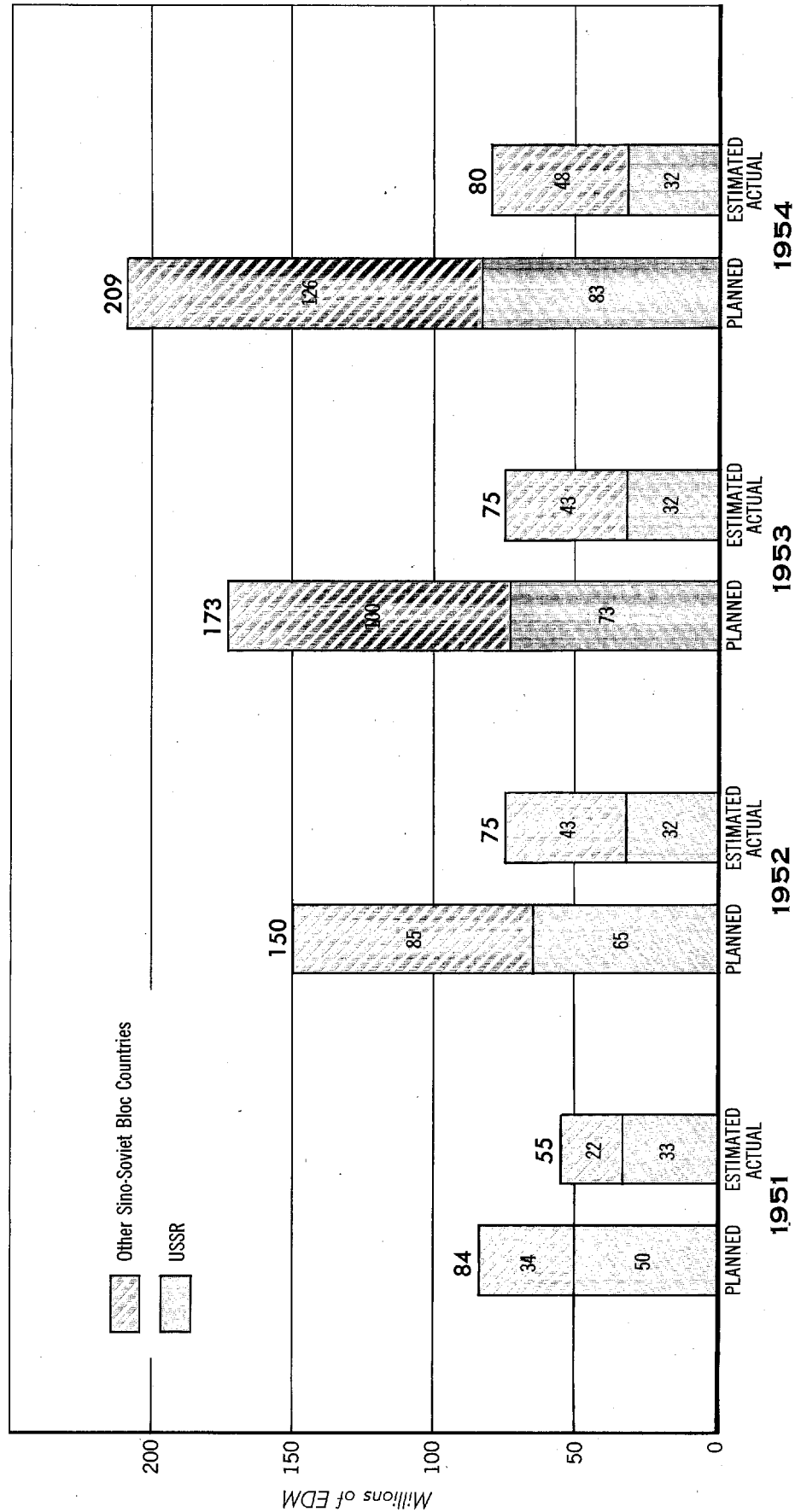
S-E-C-R-E-T

Figure 5

SECRET

EAST GERMANY

PLANNED AND ESTIMATED ACTUAL EXPORTS OF CHEMICAL EQUIPMENT TO THE SINO-SOVIET BLOC, 1951-54



25527 7-56

SECRET

S-E-C-R-E-T

liquid fuels, and liquid oxygen. 43/ Additional exports to the USSR are scheduled under the 1954 East German - USSR Trade Agreement. 44/

b. Other Countries of the Sino-Soviet Bloc.

During the last few years, East Germany has exported to Poland equipment for the production of benzene, chlorine, caustic soda, oxygen, penicillin, and organic chemicals and engineering drawings for production of liquid fuels. 45/ East Germany reportedly has produced a hydrogenation plant for production of liquid fuels 46/ for Communist China and has exported an oxygen-producing installation, filter plants, and equipment for production of ammonia and liquid fuels to Hungary. 47/

Czechoslovakia reportedly has requested from East Germany plans for a cracking plant to supply raw materials for production of ammonia and was to receive 12 oxygen plants. 48/ East Germany was to export to Rumania equipment for production of oxygen in 1953, 49/ and additional exports of chemical equipment were included in the 1954 trade agreement with Rumania. 50/

X. Capabilities, Vulnerabilities, and Intentions.

A. Capabilities.

East Germany is a major producer of chemical equipment in the Sino-Soviet Bloc and has available technical skill and production facilities. Increased production of chemical equipment could be achieved by allocating additional resources for production of chemical equipment at the cost of reducing production of other industrial equipment.

According to available reports, for technical reasons, East Germany will have a difficult task in its attempt to expand its foreign trade in general-purpose industrial equipment. Furthermore, East Germany probably cannot compete with West Germany, the UK, and the US in the field of chemical equipment, which involves the latest design and techniques.

- 19 -

S-E-C-R-E-T

S-E-C-R-E-T

B. Vulnerabilities.

One of the main shortages for production of chemical equipment in East Germany is that of raw materials, especially of stainless steel. Based on estimated data, approximately 40 percent of the total production of stainless steel in East Germany in 1953 was required for production of chemical equipment. Stainless steel for production of chemical equipment probably will continue to be in short supply, unless additional supplies or substitutes become available.

The principal difficulties in production of chemical equipment in East Germany appear to be in the casting and forging of component parts and in design. These problems become more severe with the increasing use of equipment operated under conditions of higher temperatures and pressures. The casting and forging problem should be solved in time. The question of how to overcome design problems, however, remains to be answered. It is believed that, in general, East Germany lags behind Western countries, including West Germany, in production of equipment of the latest design and workmanship. Unless East Germany obtains recent techniques from the West, East Germany probably will continue to lag in this respect.

C. Intentions.

If East Germany and the other countries of the Sino-Soviet Bloc are to continue to expand their chemical industries at the planned rates, East Germany will have to increase production of chemical equipment to meet demands. Otherwise, chemical equipment will have to be procured from the West.

- 20 -

S-E-C-R-E-T

S-E-C-R-E-T

APPENDIX A

CLASSIFICATION OF TYPES OF CHEMICAL EQUIPMENT
IN EAST GERMANY 51/

<u>Plan Position Number</u>	<u>Type of Equipment</u>
27 00 000	Chemical apparatus, pumps, and compressors
27 11 000	Chemical apparatus
27 11 120	Vulcanizers
27 11 140	Centrifuges
27 11 150	Vacuum apparatus and vacuum filters
27 11 170	Galvanizing apparatus
27 11 180	Reactors
27 11 190	Stirrers and agitators
27 11 210	Autoclaves
27 11 220	Heat exchangers and preheaters
27 11 230	Pulverizers
27 11 240	Crushers, stirrers, kneaders, and mixers
27 11 250	Filters and sieves
27 11 290	Special machines and apparatus
27 12 000	Pumps
27 12 110	Rotary pumps (turbine and centrifugal)
27 12 120	Steam pumps
27 12 140	Hand pumps
27 12 150	Piston pumps
27 12 160	Acid-resistant pumps
27 12 170	Pumps for pressures above 1,000 atmospheres
27 12 990	Miscellaneous pumps
27 13 000	Compressors
27 13 120	Turbocompressors
27 13 131	Refrigerant compressors for household refrigerators
27 13 132	Refrigerant compressors for moderately low temperatures
27 13 133	Refrigerant compressors for low temperatures
27 13 134	Refrigerant compressors for very low temperatures
27 13 141	Air compressors up to 500 cubic meters per hour
27 13 142	Air compressors above 500 cubic meters per hour

- 21 -

S-E-C-R-E-T

S-E-C-R-E-T

<u>Plan Position Number</u>	<u>Type of Equipment</u>
27 13 150	Gas compressors
27 13 990	Miscellaneous compressors
27 14 000	Ventilators
27 15 000	Air blowers
27 16 000	Machines and apparatus for liquid fuels
27 17 000	Spare parts for compressors, pumps, and ventilators
27 18 000	Spare parts for chemical apparatus

- 22 -

S-E-C-R-E-T

S-E-C-R-E-T

APPENDIX B

TYPES OF CHEMICAL EQUIPMENT PRODUCED IN EAST GERMANY BY THE MAIN ADMINISTRATIONS (HV'S)
OF THE MINISTRY FOR MACHINE CONSTRUCTION 52/

Plan Position Number	Type of Equipment	Main Administration					
		HV*	HV**	HV***	HV****	HV*****	
27 11 120	Vulcanizers			x		x	
27 11 140	Centrifuges		x	x		x	
27 11 150	Vacuum apparatus and vacuum filters	x	x			x	
27 11 210	Autoclaves		x			x	
27 11 220	Heat exchangers and preheaters		x			x	
27 11 240	Crushers, stirrers, kneaders, and mixers		x			x	
27 11 250	Filters and sieves		x			x	
27 11 290	Special machines and apparatus		x				x
27 12 110	Rotary pumps (turbine and centrifugal)		x			x	
27 12 120	Steam pumps					x	

* Main Administration for Equipment for Heavy Industry (Hauptverwaltung Ausrüstung fuer Schwerindustrie).

** Main Administration for Equipment for the Chemical, Ceramic, Food-Processing, and Luxuries Industries (Hauptverwaltung Ausrüstung fuer Chemie, Keramik, und Nahrungs- und Genussmittel Industrie).

*** Main Administration for Equipment for the Textile and Printing Industries (Hauptverwaltung Ausrüstung fuer Textil und Polygraphische Industrie).

**** Main Administration for Power Machinery and Motors (Hauptverwaltung Kraft- und Arbeitsmaschinenbau).

***** Main Administration for Machine Tool Construction (Hauptverwaltung Werkzeugmaschinenbau).

S-E-C-R-E-T

Man Position Number	Type of Equipment	Main Administration				
		HV*	HV**	HV***	HV****	HV*****
27 12 140	Hand pumps				x	
27 12 150	Piston pumps		x		x	x
27 12 990	Other pumps		x		x	
27 13 120	Turbocompressors		x		x	
27 13 130	Refrigerant compressors		x			
27 13 141	Air compressors up to 500 cubic meters per hour		x		x	
27 13 142	Air compressors above 500 cubic meters per hour		x		x	
27 13 150	Gas compressors		x		x	
27 13 990	Other compressors		x		x	
27 14 000	Ventilators		x		x	
27 15 000	Air blowers		x		x	
27 16 000	Equipment for liquid fuels		x			
27 17 000	Spare parts for compressors, pumps, and ventilators		x		x	
27 18 000	Spare parts for chemical equipment		x			
27 99 000	Other chemical equipment		x			

S-E-C-R-E-T

APPENDIX C

PROBLEMS OF PRODUCTION

1. Design.

Before a chemical process becomes commercially feasible, it must go through several stages of development. After the necessary research and development is completed in the laboratory, the results are tested, and the process is further developed on a pilot-plant basis. The next problem is the design of the equipment necessary for the particular process. Design requires a high level of theoretical and applied engineering in a number of fields, backed by extensive experience.

Because of the unusual operating conditions of the chemical industry, certain factors must be considered in the design of chemical equipment. These factors include corrosion and erosion of equipment, balanced rates of flow of materials through the various processing steps, temperatures and pressures of chemical reactions, and catalytic conditions. Improper selection of construction materials for chemical equipment will result in an increased rate of equipment replacement, contamination of the product, or failure of the equipment.

In general, the operation of a chemical plant requires a balanced rate of flow of materials through the entire plant, either as inputs, recycling, or outputs. The equipment to be used, therefore, must be custom-designed for the required capacities and coordinated into the over-all system for a balanced line of production.

Operating conditions are critical and must be kept within certain limits for the process to be technologically and economically successful. Production of nitric acid by oxidizing ammonia, for example, appears to be simple. The reaction temperature, however, must be maintained within a certain range. The rate of oxidation must be at the proper speed, and the reaction gases must be cooled rapidly. Otherwise, the chemical reaction reverses itself, and the desired end product is not obtained. A knowledge of the proper operating-pressure range also will increase the efficiency of the reaction.

- 25 -

S-E-C-R-E-T

S-E-C-R-E-T

Almost all high-pressure chemical syntheses are dependent upon catalysts to achieve sufficiently rapid reactions to make them commercially feasible. In spite of all the research that has been done on the theory of catalysis, the only reliable way to determine the best catalyst for a particular chemical reaction is through trial and error. Different catalysts require different operating conditions for the production of a particular chemical. A change in catalysts often will require changes in design and construction materials of chemical equipment.

Furthermore, general-purpose industrial equipment, such as pumps, compressors, blowers, heat exchangers, and the like, must be designed and built for particular operating requirements. Because each plant generally has its own set of operating conditions which require specific construction materials and chemical processes, these items of equipment then must be coordinated with custom-designed special equipment so that the differing operating conditions and requirements of each plant can be met. Two chemical plants producing the same chemicals but installed by different engineering companies often use different chemical processes, requiring different equipment.

To cope with the large number of variable factors, the design of chemical equipment demands top-level engineering skill and experience. Design, based on extensive theoretical and practical background, results in a set of technical data in the form of engineering drawings. The drawings show the arrangement of various items of equipment and specifications for construction materials, size, operating temperatures, pressures, rates of flow, catalytic conditions, and corrosion-resistant requirements. The drawings coordinate all items of equipment for a particular chemical plant into a balanced chemical production line.

2. Construction.

A wide variety of manufacturing processes is used in the production of chemical equipment. Casings of pumps and compressors are cast. Crankshafts for various items are forged. High-pressure equipment may be forged or built up by layers. Steel plate is cut, formed, and welded. Depending upon its type and use, certain equipment must be heat-treated for stress relief and X-rayed for defects. Machining and other metal-finishing operations are used to finish castings, forgings, and other components of equipment.

S-E-C-R-E-T

A working knowledge of the characteristics of the construction materials used is essential. Glass, rubber, plastics, or other corrosion-resistant materials used for lining chemical equipment impose specific construction problems. A pinhole in the lining will cause contamination of the product and failure of the equipment. Alloys, when heated as in a welding operation, may undergo changes affecting their physical or corrosion-resistant properties, or both. Welding techniques, therefore, must be adjusted to the type of alloy used.

3. Assembly and Initial Operation of a Chemical Plant.

After the chemical equipment is designed and built, there remain the problems of installation and of initial operation of a chemical plant. In spite of the many operating problems which are eliminated in the pilot-plant stage, unexpected difficulties occur and must be solved before a plant begins commercial production.

Design capacities may be inadequate, and further changes in design may be necessary. Certain items of equipment may fail under unexpected stresses. The installation of certain equipment may have to be modified, requiring additional changes in other items of equipment before a balanced line of production can be established. To anticipate the worst, the transition from the pilot-plant stage to a commercial plant may be a complete failure.

4. Changing Techniques.

If engineering drawings are available, there are no major design problems involved in producing chemical equipment for replacement purposes. Industrial processes, however, are not static, especially in the chemical industry. Shortages of copper and nickel become critical, and new plastics are developed to overcome these shortages. Demands for new and improved weapons require better lubricants, explosives, and guided missile propellants. Jet aircraft demand improved fuels. New chemical products are developed, and existing chemical plants may become obsolete. New processes and construction materials become available. Because of constant changes, the design and construction of efficient and economic chemical plants must be geared to such changes.

S-E-C-R-E-T

5. Labor.

Because corrosion is one of the major problems in the chemical industry, various corrosion-resistant materials must be used. Corrosion-resistant linings must cover all contact areas, and the joints in clad metals must be specially handled to prevent corrosion of the base metal and ultimate failure of the equipment. Requirements for labor, therefore, vary from unskilled to highly skilled and experienced labor, depending upon the construction materials used.

Another problem of the chemical industry is that of operating at high temperatures and pressures. Production of processing equipment to meet these conditions requires skilled labor, and the skill demanded increases with higher temperatures and pressures.

The degree of labor skill required for production of pumps, compressors, and other types of general-purpose industrial equipment varies with the type of equipment produced. Production of large pumps and compressors for high pressures and capacities requires highly skilled labor to make patterns and molds for impellers, casings, shafts, and bearings. Higher operating characteristics demand greater precision in metalforming, in cuttings, and in adherence to specifications and tolerances.

In addition to professional labor required for the design of chemical equipment, other types of labor required are foundry, metalshop, layout, and sheet-metal workers; machinists; and welders.

S-E-C-R-E-T

APPENDIX D

STATISTICAL TABLES

Table 3

Planned and Estimated Actual Production of Chemical Equipment
in East Germany
1949-54

	Million DME					
	<u>1949</u>	<u>1950</u>	<u>1951</u>	<u>1952</u>	<u>1953</u>	<u>1954</u>
Planned	79 <u>a/</u>	140 <u>a/</u>	201 <u>b/</u>	270 <u>b/</u>	328 <u>b/</u>	395 <u>b/</u>
Estimated Actual	102 <u>c/</u>	117 <u>d/</u>	130 <u>d/</u>	139 <u>d/</u>	147 <u>c/</u>	153 <u>c/</u>

a. Estimated from log-log trend line of 1951-55 planned data.

b. 53/

c. Calculated from $\log Y = 1.26 + 0.0067X$, where Y = index of industrial production and X = production of chemical equipment in million DME. Index data are from source 54/. For the derivation of the equation, see Appendix E.

d. 55/

S-E-C-R-E-T

S-E-C-R-E-T

Table 4

Planned and Estimated Actual Distribution of Chemical Equipment in East Germany a/
1951-54

Sector	1951			1952			1953			1954		
	Planned (Million DME)	Actual (Million DME)	Percent of Actual Distribution	Planned (Million DME)	Actual (Million DME)	Percent of Actual Distribution	Planned (Million DME)	Actual (Million DME)	Percent of Actual Distribution	Planned (Million DME)	Actual (Million DME)	Percent of Actual Distribution
Exports	84	55	42	150	75	54	173	75	51	209	80	52
Industrial investment	45	29	22	63	31	22	89	38	26	102	38	25
Maintenance and repair	35	23	18	42	21	15	50	22	15	61	23	15
Other b/	37	23	18	26	12	9	27	12	8	34	12	8
Total	201	130	100	281	132	100	339	147	100	406	153	100

a. Figures for planned distribution were obtained from source 56/. Figures for estimated actual distribution were derived by applying annual planned distribution ratios to data for annual actual production.

b. Includes agriculture, transportation, consumer goods, and inventory.

- 30 -

S-E-C-R-E-T

S-E-C-R-E-T

Table 5
Planned and Estimated Actual Exports of Chemical Equipment from East Germany, by Destination a/
1951-54

Destination	1951				1952				1953				1954			
	Planned (Million IME)	Actual (Million IME)	Percent of Actual Distribution		Planned (Million IME)	Actual (Million IME)	Percent of Actual Distribution		Planned (Million IME)	Actual (Million IME)	Percent of Actual Distribution		Planned (Million IME)	Actual (Million IME)	Percent of Actual Distribution	
USSR	50	33	60		65	32	43		73	32	43		83	32	40	
Other countries of the Sino-Soviet Bloc	34	22	40		85	43	57		100	43	57		126	48	60	
Total	84	55	100		150	75	100		173	75	100		209	80	100	

a. Estimates for 1951-54 were derived by applying planned exports to certain areas to estimated total available exports. Plan data for 1951 are from source 57/. Plan data for 1952-54 are from source 58/. Ruble data were converted to IME on the basis of 1 IME = US \$0.30 and 1 ruble = US \$0.25. Figures were derived on the assumption that the balance of planned exports would be exported largely to the Sino-Soviet Bloc. Figures for total planned exports were obtained from source 59/.

S-E-C-R-E-T

APPENDIX E

METHODOLOGY

1. Calculation of Estimate of Production in 1936.

The calculation of the estimate of production of chemical equipment in East Germany in 1936 is shown in Table 6.*

2. Production.

Chemical equipment, as defined by the East German government, covers a wide variety of general-purpose industrial equipment, such as pumps, compressors, centrifuges, vacuum filters, heat exchangers, crushers, pulverizers, ventilators, and air blowers. These types of general-purpose industrial equipment are used throughout the East German industrial economy in the power, mining, metallurgical, manufacturing, transportation, and consumer goods industries, as well as in the chemical industry. Based on the broad distribution of chemical equipment, a correlation was made between the index of industrial production and production of chemical equipment. The derived equation is $\log Y = 1.26 + 0.0067X$, where Y = index of industrial production and X = production of chemical equipment in million DME. Table 7** compares the East German index of industrial production with production of chemical equipment in East Germany in 1949-54.

The derived equation is based on data for 3 years, 1950-52, and seems reasonable. When data for production of chemical equipment in the first half of 1953 are doubled, the annual production figure is 141 million DME, compared with 147 million DME computed from the equation. Furthermore, based on the extrapolation of 1950-52 data, the value of production of chemical equipment in East Germany in 1949 was approximately 100 million DME, compared with the calculated figure of 102 million DME. The extrapolated value of production in 1954 is about 155 million DME, compared with the calculated figure of 153 million DME.

* Table 6 follows on p. 34.

** Table 7 follows on p. 35.

S-E-C-R-E-T

Table 6

Calculation of the Estimate of Production of Chemical Equipment in East Germany a/
1936

1	2	3
Actual Production in Germany in 1936 b/ (Thousand Reichsmarks)	East German Production in 1928 c/ (Percent of Total German)	Estimate of Production in East Germany in 1936 d/ (Thousand Reichsmarks)
Compressors, blowers, and refrigeration plants Pumps and fire-fighting apparatus Machinery for the chemical industry	200,000 90,000 250,000	58,000 26,100 100,000
Total	184,000 e/	

a. The estimate of production in 1936 probably is high and is not strictly comparable with the present East German classification of chemical equipment, because of the inclusion of refrigeration plants and fire-fighting apparatus.

b. 60/

c. 61/. Fifty percent of the production in Berlin was assumed to be in the Soviet Zone.

d. Column 1 times Column 2.

e. Rounded.

S-E-C-R-E-T

Table 7

Comparison of Index of Industrial Production
and Production of Chemical Equipment in East Germany
1949-54

<u>Year</u>	<u>Index of Industrial Production ^{a/}</u>	<u>Production of Chemical Equipment (Million DME)</u>
1949	88	102 ^{b/}
1950	111	117 ^{c/}
1951	136	130 ^{c/}
1952	157	139 ^{c/}
1953	176	147 ^{b/} ^{d/}
1954	194	153 ^{b/}

a. ^{62/}

b. Calculated from $\log Y = 1.26 + 0.0067X$, where Y = index of industrial production and X = production of chemical equipment in million DME.

c. ^{63/}

d. Data from source ^{64/} for the first half of 1953, on an annual basis, give a value of 141 million DME.

3. Distribution.

The estimated distribution of chemical equipment in East Germany was derived by applying annual planned distribution ratios to estimated actual annual production.

4. Exports by Area.

Based on the assumption that chemical equipment not exported to the USSR would be largely exported to other countries of the Sino-Soviet Bloc, planned exports to the USSR were deducted from the total planned exports of East Germany. Estimated actual exports to the USSR and to the rest of the Bloc were then derived by applying percentages for planned exports by area to total available exports of chemical equipment.

S-E-C-R-E-T

5. Inputs of Raw Materials.

Using the average inputs of the various raw materials per dollar of production of chemical equipment, pumps, compressors, and blowers during 1949-52 in the US, estimated East German inputs were derived by applying the ratio of 1 DME = US \$0.30 to data for production of chemical equipment in East Germany.

- 36 -

S-E-C-R-E-T

S-E-C-R-E-T

APPENDIX F

GAPS IN INTELLIGENCE

Information on production and other economic aspects of chemical equipment is considered inadequate. The principal gaps in intelligence concerning chemical equipment in East Germany are as follows:

1. Annual data on total production of chemical equipment and on production by major classification, such as chemical equipment, pumps, compressors, ventilators, air blowers, and equipment for production of liquid fuels. Total production data are available for several years, and estimates for other years were derived from the index of industrial production. There are little or no data on production of chemical equipment by major classification.
2. Price data on a representative basis to develop a price index for chemical equipment. There now is no such information available to compute the index.
3. Distribution of chemical equipment by various sectors. Information on the distribution of production also is relatively unavailable. Any data on the amount of equipment allocated to the various industries and to export possibly would help to fill the gaps in production data.
4. Trade data, including data on exports to individual countries of the Sino-Soviet Bloc and to countries outside the Bloc, by type of commodity and value. Total figures are available for East German exports to the USSR, but not by type. Little or no information is available on intra-Bloc trade.
5. Imports of chemical equipment by East Germany. Based on past information, on the shortage of chemical equipment in East Germany, and on the relaxation of Coordinating Committee on Export Control (COCOM) controls, it is believed that East Germany is importing chemical equipment from the West. Data on East German imports, by type, value, and country, are needed.
6. Inputs of raw materials by weight, particularly of stainless steel and other corrosion-resistant materials which are in short

- 37 -

S-E-C-R-E-T

S-E-C-R-E-T

supply in East Germany. Because of a lack of East German data, US data were used. Inasmuch as the prices of raw materials vary widely, based on composition and degree of fabrication, it is desirable to have inputs by weight.

7. Actual rates of replacement of various items of chemical equipment. There is no information available on rates of replacement, and rates of depreciation are not too useful for estimating replacement.

Because production of chemical equipment is carried out under the Ministry for Machine Construction and the Main Administration for Equipment for the Chemical, Ceramic, Food-Processing, and Luxuries Industries, these organizations are the most probable sources of information on production, distribution, and other economic aspects of chemical equipment. Further information on production problems of the Ministry, the main administrations, and the principal plants producing chemical equipment is desired.

Additional information on the dependence of the Sino-Soviet Bloc upon exports of chemical equipment from East Germany is essential. The most likely source of this information is DIA Chemieausrustungen, Berlin. Other trade data on the export of complete chemical plants may be obtained from DIA Invest-Export, Berlin. These organizations probably are the best sources of information on imports of chemical equipment.

The following sources may provide information on problems of design and production technology: Konstruktions- und Ingenieurbuero Chemie (KIB Chemie), Leipzig; Konstruktions- und Ingenieurbuero Abteilung MTAS (KIB Section 5), Berlin; and Projektierung und Anlagenbau Chemie, Dresden.

- 38 -

S-E-C-R-E-T

S-E-C-R-E-T

APPENDIX G

SOURCE REFERENCES

This report was based on information obtained principally from documentary and other sources considered to be reliable.

Evaluations, following the classification entry and designated "Eval.," have the following significance:

<u>Source of Information</u>	<u>Information</u>
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

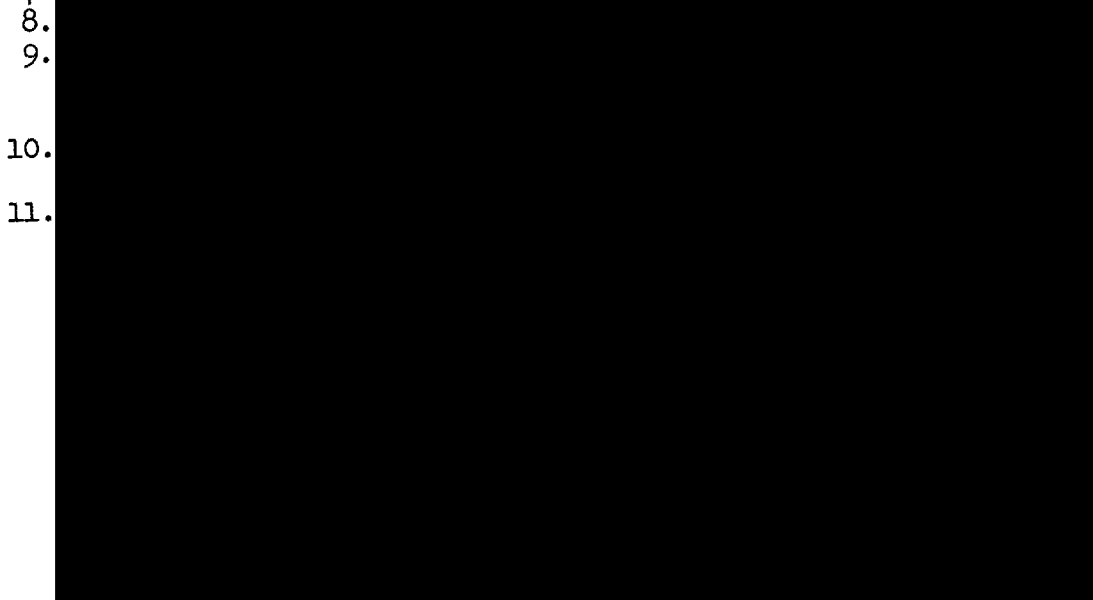
Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this report. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

S-E-C-R-E-T

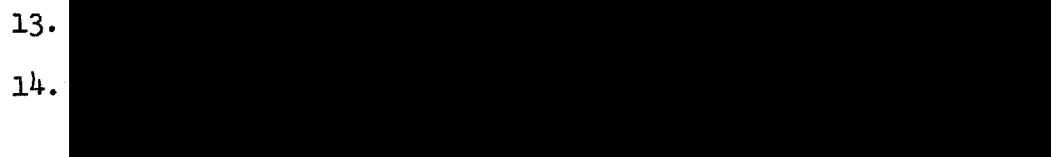
S-E-C-R-E-T

1. Regierung der Deutschen Demokratischen Republik, Staatliche Zentralverwaltung fuer Statistik. Volkswirtschafts Plan 1954 Schluesselliste (National Economic Plan for 1954 Code List). U. Eval. Doc. (hereafter referred to as Volkswirtschafts Plan 1954 Schluesselliste.)
2. Manufacturing Chemists' Association, Inc. The Chemical Industry, 2d edn, 1955, p. 7. U. Eval. RR 1.
3. Ibid., p. 122. U. Eval. RR 1.
4. Huston, Howard R. "Maintenance of Mobilization - The Chemical Industry," Armed Forces Chemical Journal, vol VII, no 1, p. 20. U. Eval. RR 1.
5. Manufacturing Chemists' Association, Inc. The Chemical Industry (2, above), p. 118. U. Eval. RR 1.
6. "Satellite Chemicals: Infirm Foundation," Chemical Week, 4 Apr 53, p. 16. U. Eval. RR 2.
7. Ibid.

25X1A



12. Commerce, Defense Production Administration. Steel, Copper, and Aluminum Consumption in CMP "B" Products 1947-1952, 8 Aug 52. R. Eval. Doc.



25X1A

- 40 -

S-E-C-R-E-T

Approved For Release 2000/04/17 : CIA-RDP79-01093A001100100001-5
25X1A

Next 3 Page(s) In Document Exempt

Approved For Release 2000/04/17 : CIA-RDP79-01093A001100100001-5

Approved For Release 2000/04/17 : CIA-RDP79-01093A001100100001-5
~~CONFIDENTIAL~~
~~SECRET~~

Approved For Release 2000/04/17 : CIA-RDP79-01093A001100100001-5
~~CONFIDENTIAL~~
~~SECRET~~